NICE^3
Success Story

Membrane Filtration Technology to Process Black Olives

Tri Valley Growers Develops Wastewater Purification System to Eliminate Salt Water Emissions

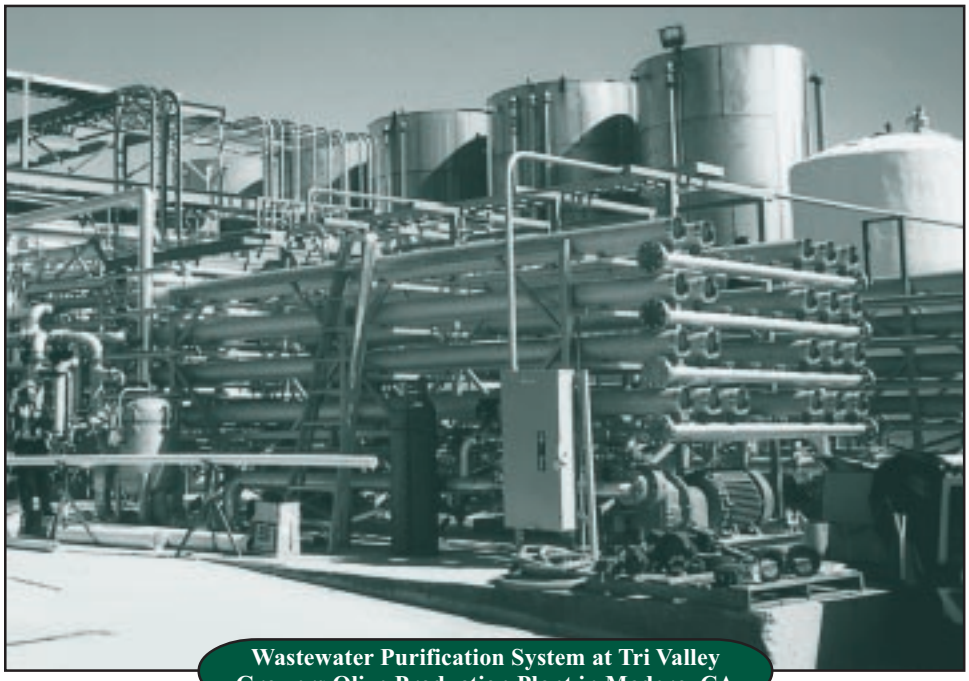
Benefits

- Can save an estimated 36 billion Btu/year of energy
- Eliminates wastewater discharge
- Allows waste materials to be converted into useful by-products such as animal feed or fuel

Applications

This new membrane filtration wastewater purification system can be used with all food processors and has been successfully demonstrated at an olive processing plant.

An innovative wastewater purification process using an advanced membrane technology will help California's olive industry save energy and protect the environment. By recycling salty wastewater from black olive processing plants, a new membrane filtration wastewater purification system will eliminate almost all groundwater pumping, reducing electrical energy consumption and groundwater contamination, and will completely eliminate the need for evaporative ponds. Tri Valley Growers developed and installed the membrane system with support from the U.S. Department of Energy's NICE^3 (National Industrial Competitiveness through Energy, Environment, and Economics) Program.



Wastewater Purification System at Tri Valley Growers Olive Production Plant in Madera, CA

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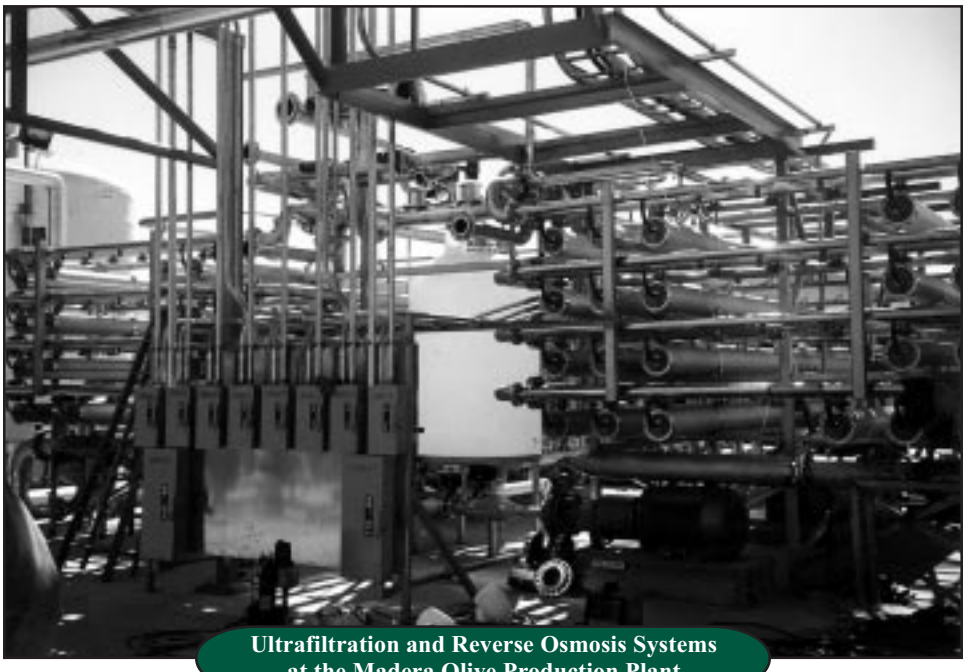
Each year California's olive industry generates more than $100 million in income. One black olive processing plant can produce nearly 100 million gallons of liquid waste a year. Most of the waste contains high concentrations of salt. According to Bob Moore, plant manager for the Tri Valley Growers Olive Production Plant in Madera, California, disposing of such large quantities of contaminated salt water can seriously impact groundwater quality. "It made environmental and economic sense for us to develop a better long-term approach that will keep our industry viable." Tri Valley Growers combined a new advanced membrane technology with a systems integration perspective to solve this significant problem.

"We anticipate that there will be a wide range of facilities throughout the food-processing industry where similar systems can help solve environmental problems, reduce energy use, and save companies dollars."

-Bob Moore
Plant Manager
Tri Valley Grower's Madera Plant



Ultrafiltration and Reverse Osmosis Systems at the Madera Olive Production Plant

Process Design and Benefits

For its new system, Tri Valley Growers implemented an ultrafiltration, reverse osmosis and evaporation process. The key to the process is the advanced membrane technology. The process involves a prescreening treatment using a cyclone separation system followed by ultrafiltration and reverse osmosis – a process traditionally used to convert ocean water to potable water.

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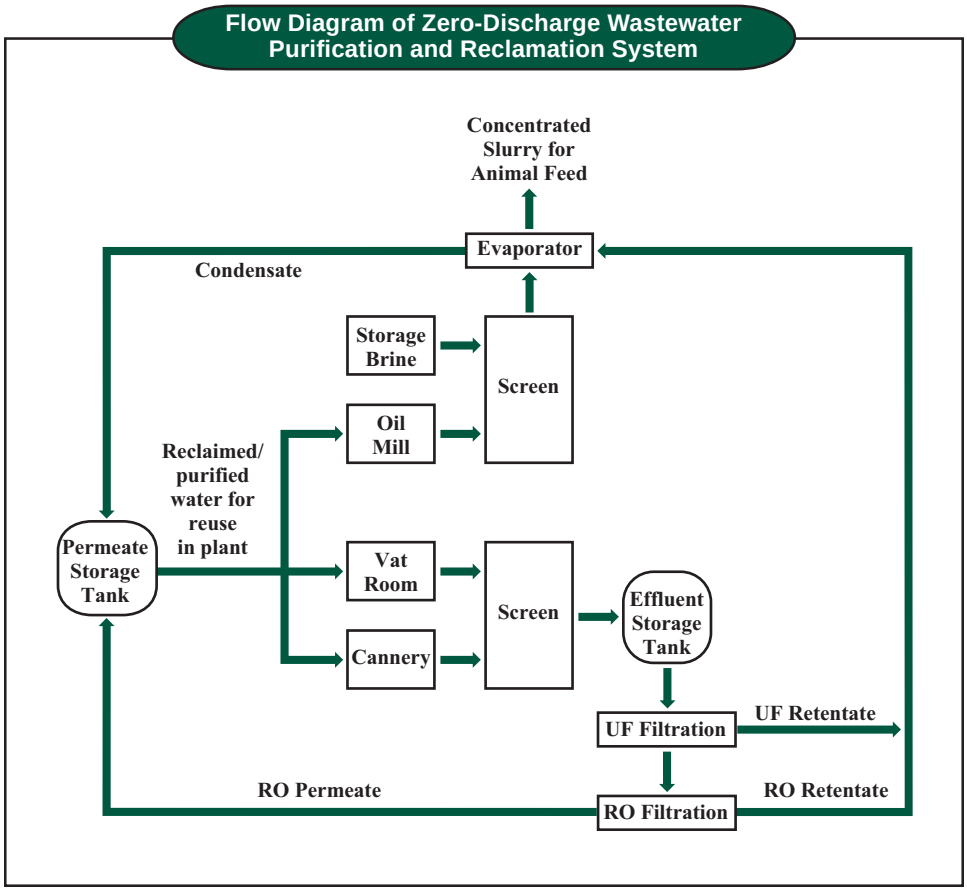
Project Partners

- Tri Valley Growers
  San Ramon, CA
- California Energy Commission
  Energy Efficiency Division
  Sacramento, CA

Up to 80% of the wastewater is recycled back into the plant. The remaining waste is dehydrated by evaporation and converted into a concentrate containing by-products that can be used as animal feed. Olive pomace (pits and other material) from the process has an energy content (9,200 Btu/lb or 21,400 kJ/kg) greater than coal and can be used to fuel biomass cogenerators.

The net benefits of this process reflect the systems' integration perspective. New environmental regulations made the evaporation ponds where the plant discharged its process brine obsolete. Initially, Tri Valley Growers considered replacing the evaporation ponds with a biological treatment system consisting of fermentors, a biotrickling filter, and a box dryer. However, the high capital cost and energy requirements for this system forced Tri Valley Growers to look at alternative systems. The membrane system installed has saved an estimated 36 billion Btu/year of power compared with the alternate biotreatment system. The system has also prevented plant closure and job losses.

Flow Diagram of Zero-Discharge Wastewater Purification and Reclamation System



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This process has several environmental benefits. The primary benefit is preventing groundwater contamination from the salt used in the olive treatment process by recycling wastewater. Air pollution emissions are reduced because of reduced electrical energy requirements. The solids and concentrated liquids produced by the process are used as an animal feed component; thus, zero-discharge is achieved. The energy and environmental benefits of the purification system translate into dollars as well. Tri Valley Growers expects the system to pay for itself in approximately four years.

Commercialization Success

The widespread participation and interest in this project are testimony to its potential benefits. In addition to a $400,000 NICE^3 grant, Tri Valley Growers has invested nearly $6.7 million, the California Department of Trade and Commerce has contributed $250,000 and the Pacific Gas and Electric Company has contributed $100,000. Other partners in the project include the California Environmental Protection Agency, the State Water Resources Control Board, Osmonics, Niro Inc., and EcoLab. The University of California at Davis, the Electric Power Research Institute, Pacific Gas and Electric Company, California League of Food Processors, National Food Processors Association, and Pacific Northwest National Laboratory have joined Tri Valley Growers in demonstrating this technology and looking for potential applications across the food-processing industry.

In 1997, Tri Valley Growers installed all the system equipment in its Madera plant and began full operation. In September, it demonstrated the technology for industry, state, and federal sponsors. The technology successfully performed as expected. According to Mr. Moore, Tri Valley Growers hopes this technology can be used to clean up wastewater from processing other foods such as sugar, potatoes, carrots, and peas. Plans are in place to transfer this technology through open houses, professional presentations, and reports. “We anticipate that there will be a wide range of facilities throughout the food-processing industry where similar systems can help solve environmental problems, reduce energy use, and save companies dollars.”

NICE^3 Program

NICE^3 – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $500,000. Grants fund up to 50% of total project cost for up to 3 years.

NICE^3 Program Manager: Lisa Barnett (202) 586-2212.

For additional information, please contact:

Bob Moore
Tri Valley Growers
12806 Road 26
P.O. Box 899
Madera, CA 93637
Phone: (559) 674-8741
Bob.Moore@TriValleyGrowers.com

Home Page:
www.trivalleygrowers.com

For more information about the NICE^3 Program, contact:

Lisa Barnett
NICE^3 Program Manager
Phone: (202) 586-2212
Fax: (202) 586-7114
lisa.barnett@ee.doe.gov

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Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585-0121

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